Late Glacial and Holocene pollen records from the Aisne and Vesle valleys, Northern France: the pollen diagrams Maizy-Cuiry and Bazoches

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Abstract

Discussed are two pollen diagrams obtained from small organic deposits in the valleys of the Aisne and Vesle, Northern France. The region in question forms part of the Paris Basin, and more precisely the Soissonnais. The diagrams were made to reconstruct the former vegetation in this archaeologically well-documented area. The information concerns the Late Glacial and Holocene.

Introduction

In the valleys of the river Aisne and its tributary the river Vesle gravel extraction is fast destroying large areas of terrace. The traces of former occupation vanish with them. A team of archaeologists from the Equipe de Recherche Archéologique no 12 of the CNRS is continuously trying to document as much of this disappearing landscape as possible. The result is a detailed knowledge of the occupational history of the valley bottoms and sides. The higher parts of the landscape are less intensively studied, but it has become sufficiently clear that, in pre- and protohistory, it was exactly the valleys themselves that were the most densely settled areas of the region. The reason for this might be that the uplands were, and still are, poor in water.

My role in the research programme is to investigate the botanical remains. Most of this work is devoted to an analysis of the fruits and seeds retrieved by wet-sieving from anthropogenic deposits, but these mainly give information on the food economy of the former populations. I wanted to provide information on the former vegetation of the area as well.

Suitable pollen traps are scarce. Pollen can be retrieved from the fills of pits and ditches within the excavated settlements (Firmin 1982, 1987). However, the catchment area of this kind of trap is assumed to be very local and part of the pollen might have even originated from discarded bedding remains and other domestic and agrarian waste. More recent contamination by the action of soil fauna can also not be excluded (Bakels 1988). Pollen-bearing deposits were therefore sought which were not of human origin.

Description of the area

The area in question forms part of the Paris Basin and more precisely the plateau of the Soissonnais (Figures 1 and 2). It consists of Eocene limestone on top of sands and clays. The limestone is covered by loess deposits of varying thickness. The rivers Aisne and Vesle have cut deep valleys into the plateau which as a result rises some 100 m above the valley floors. The edges of the plateau are indented by small side valleys. On the valley bottoms terraces of Pleistocene origin consist of gravel with flood loam on top. The Holocene flood plains cover a rather narrow area.

The area is very well drained and therefore not very suited to peat formation. The plateau itself has no organic deposits at all. The search for peat in abandoned river channels of the river Aisne was fruitless. Peat has, however, formed on a very small scale in the side valleys. The clays function as the base of aquifers and spring horizons are present where these are cut by the valleys. In some places drainage is blocked and this has favoured local peat formation. One of the diagrams presented here, Maizy-Cuiry, was obtained from such a deposit. The source of the other, Bazoches, is a depression in the valley of the Vesle.

Figure 1
France. The shaded area represents the sector under study.

The pollen diagram Maizy-Cuiry

As mentioned above, the Maizy-Cuiry core was taken from a peat deposit formed in a small side valley of the river Aisne which is situated between the villages Maizy and Concevreux (49°23'N, 3°48'E). Its local name is "Le Grand Marais" even though its dimensions are only 300 x 400 m (Figure 4, Concevreux could not be shown here).

The place was chosen because it was the only peat found in the vicinity of the archaeologically important site Cuirylès-Chaudardes. The distance between site and peat is still rather great, a two km, but a closer location could not be found. The terrace near Cuiry contained important settlements from the Early Neolithic Bandkeramik culture onwards. Bandkeramik (6100 - 5900 BP), Michelsberg (5200 - 4800 BP) and Iron Age - Gallo-Roman (2700 - 1600

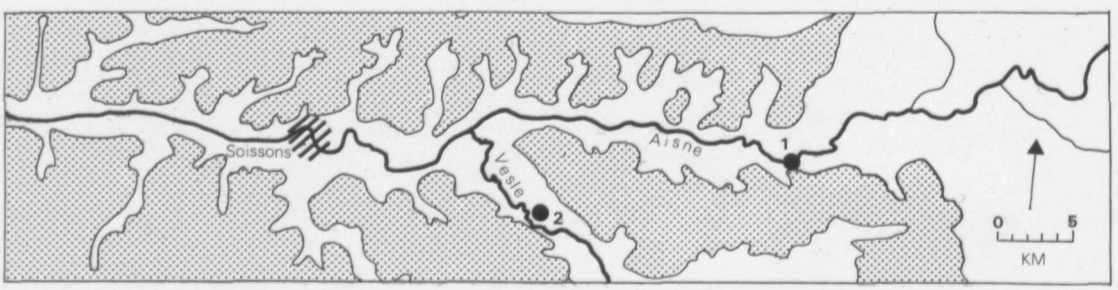


Figure 2
The Aisne and Vesle valleys near Soissons with the sampled peat deposits.
1 Maizy-Cuiry,
2 Bazoches.
The plateau is indicated by shading.

BP) are especially well represented. In addition two Michelsberg so-called lowland enclosures have been found rather close by: Maizy-sur-Aisne and Concevreux. These are not thought to have functioned as normal agrarian settlements as did the one near Cuiry, but might have served a special purpose.

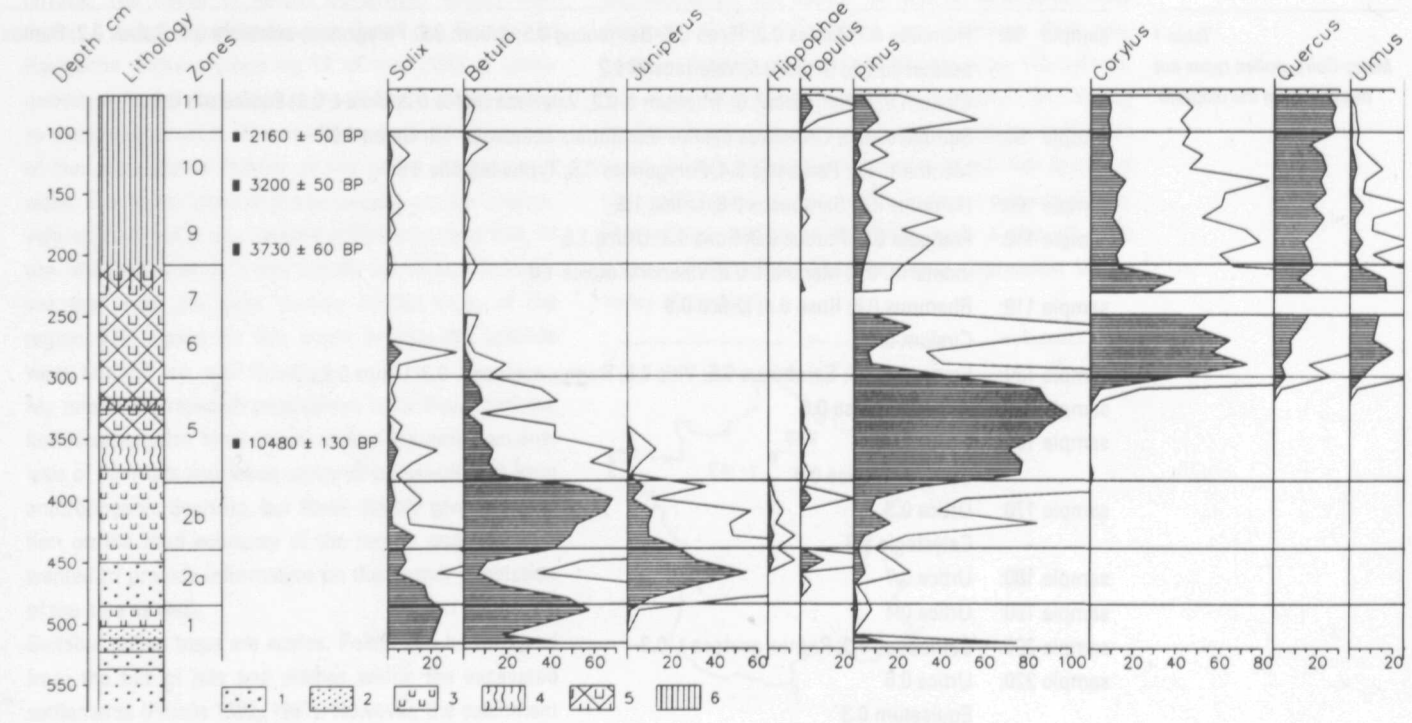
The deepest part of the organic deposit was chosen for boring. It showed the following stratigraphy:

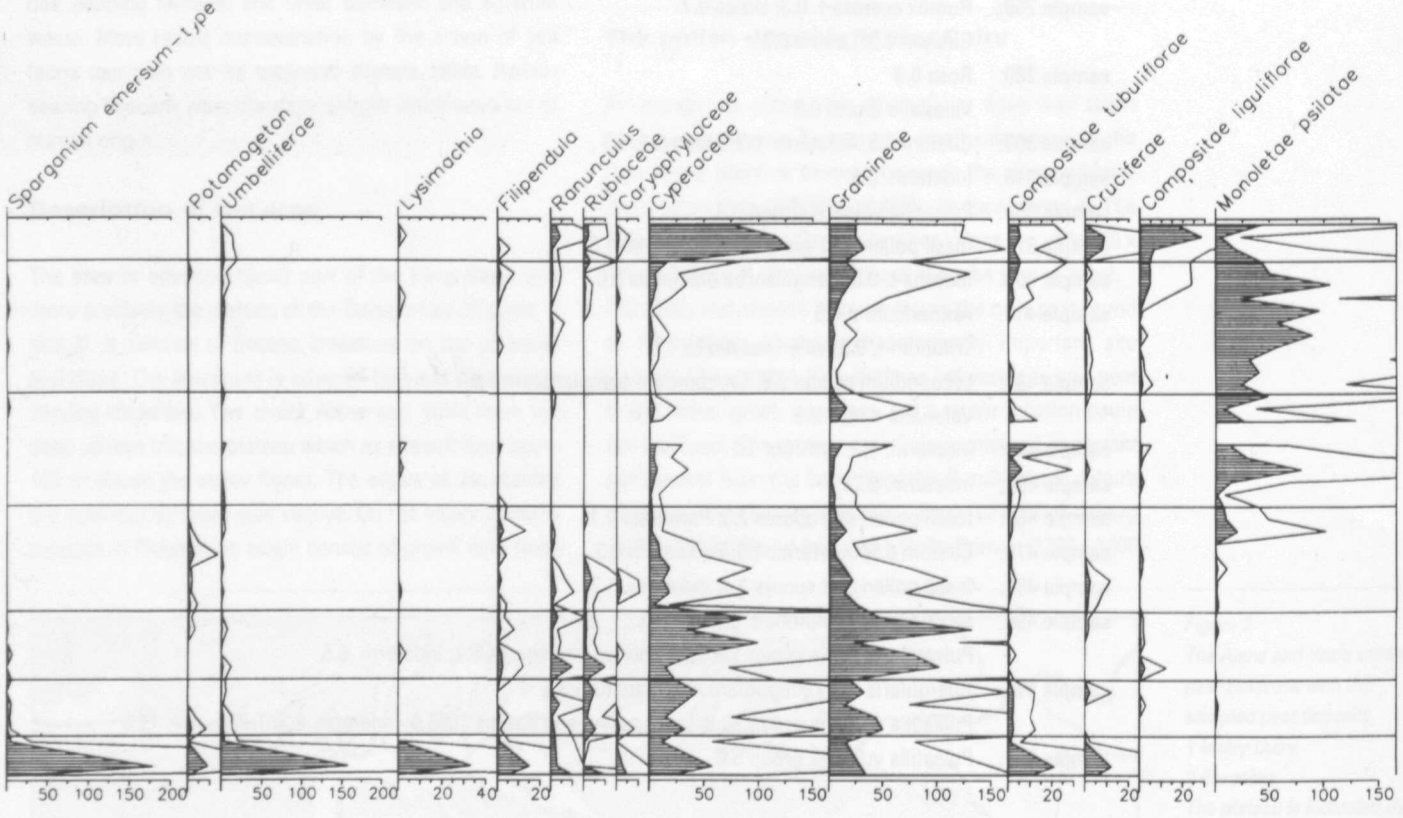
Table 1
Maizy-Cuiry, pollen types not mentioned in the diagram.

sample 80:	Humulus 0.2; Malus 0.2; Picea 0.5; Sambucus 0.5; Allium 0.2; Polygonum aviculare 0.7; Rubus 0.2; Rumex acetosella 0.5; Urtica 0.5; Valerianella 0.2
	Cirsium 0.2; Parnassia 1.0; Trifolium-t. 0.2; Valeriana dioica 0.2; Vicia-t. 0.2; Equisetum 0.2
sample 90:	Sambucus 0.6; Centaurea cyanus 0.6; Rumex acetosella 1.2; Urtica 3.0
	Mentha-t. 1.2; Parnassia 2.4; Polygonum 0.6; Typha latifolia 0.6
sample 100:	Humulus 0.8; Sambucus 0.8; Urtica 1.6
sample 110:	Frangula 0.3; Prunus 0.3; Rosa 0.3; Urtica 1.6
	indeterm. 0.3; Mentha-t. 0.6; Valeriana dioica 1.0
sample 119:	Rhamnus 0.8; Rosa 0.4; Urtica 0.8
	Cirsium 0.4
sample 130:	Frangula 23.9; Sambucus 0.5; Vitis 0.5; Rumex acetosa-t. 0.3; Urtica 0.8
sample 140:	Ribes 0.3; Rosa 0.6
sample 150:	Urtica 0.3
	Valeriana dioica 0.3
sample 170:	Urtica 0.3
	Calystegia 0.3
sample 180:	Urtica 0.7
sample 190:	Urtica 0.4
sample 200:	Sambucus 0.3; Rumex acetosa-t. 0.3
sample 220:	Urtica 0.6
	Equisetum 0.3
sample 230:	Rumex acetosa-t. 0.4
	Valeriana dioica 0.4
sample 250:	Rumex acetosa-t. 0.3; Urtica 0.7
	Cirsium 0.3; Lemna 0.3
sample 280:	Rosa 0.3
	Valeriana dioica 0.3
sample 300:	Cirsium 0.3; indeterm. 0.9; Stachys-t. 0.3
sample 310:	indeterm. 0.3
sample 350:	Pulsatilla vulgaris-group 0.3
sample 370:	fossil pollen and spores 0.5; indeterm. 1.0
sample 400:	Mentha-t. 0.6; Sanguisorba officinalis 0.6
sample 410:	Anthericum-t. 0.5
	Trifolium-t. 0.5; Valeriana dioica 0.5
sample 430:	Lycopodium selago 2.6; Lycopodium complanatum 2.6
	Valeriana dioica 2.6
sample 440:	indeterm. 0.3; Lythrum 1.2
sample 450:	indeterm. 3.7
sample 460:	fossil pollen and spores 2.3; Parnassia 1.1
sample 470:	Cirsium 0.7; indeterm. 1.0; Equisetum 0.3
sample 480:	fossil pollen and spores 1.4; indeterm. 1.7
sample 490:	Saxifraga oppositifolia-t. 0.5
	Pulsatilla vulgaris-group 1.6; fossil pollen and spores 8.2; indeterm. 0.5
sample 510:	Spergularia 3.1; Lycopodium complanatum 3.1
	Pulsatilla vulgaris-group 18.8; fossil pollen and spores 1665.6; indeterm. 6.3; Trifolium-t. 15.6
sample 517:	Pulsatilla vulgaris-group 5.0

Maizy-Cuiry

Analysis C.C. Bakels





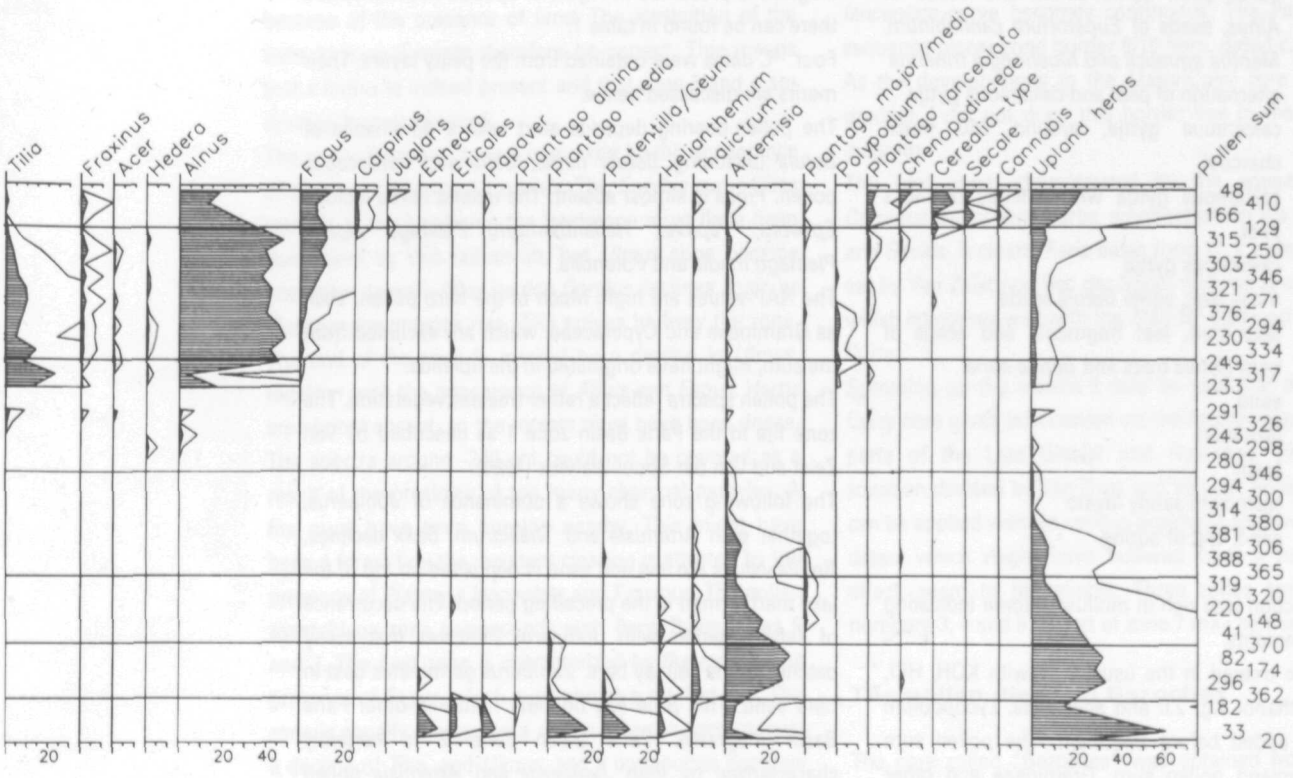


Figure 3
The pollen diagram Maizy-Cuiry.
Open curves 5x.

1 sand,
2 loam,
3 lake marl,
4 moss peat,
5 calcareous gyttja,
6 telmatic peat.

below surface

0 - 205 cm	*Carex* peat, some cones and seeds of *Alnus*, seeds of *Eupatorium cannabinum, Mentha aquatica and Moehringia trinervia*
205 - 225	alternation of peat and calcareous gyttja
225 - 317	calcareous gyttja, around 240 much charcoal
317 - 325	calcareous gyttja with patches of moss peat
325 - 347	calcareous gyttja
347 - 373	moss peat, some *Betula* seeds
373 - 450	lake marl, leaf fragments and seeds of both *Betula* trees and *Betula nana*
450 - 485	sand
485 - 501	lake marl
501 - 512	loam
512 - 520	loam with sandy layers
534 - 555	sand, end of boring

The whole section was rich in molluscs, some indicating spring environments.

Samples were treated in the usual way with KOH, HCl, bromoform-ethanol s.g. 2.0 and acetolysis. *Lycopodium* tablets were added before treatment. The pollen sum used is an upland pollen sum. Gramineae and other plants which might have taken part in peat formation are excluded. After some hesitation *Alnus* and *Salix* were left in, although seeds and cones of the former were found in the upper part of the deposit. *Alnus* pollen, however, never reached the high percentages attributed to strictly local *Alnus*. The tree might have grown in the forest on the steep valley side nearby. The same applies for *Betula*.

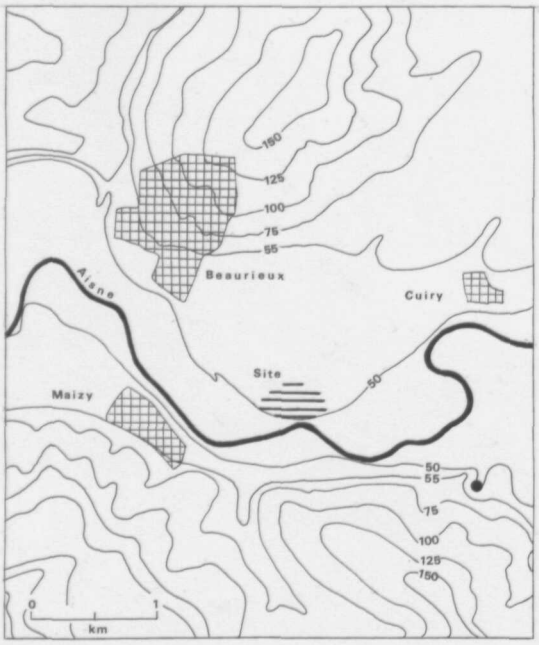


Figure 4
The location of the Maizy-Cuiry core (black dot). Hatched: archaeological site. Double hatched: modern villages.

The pollen sum aimed at was 300 grains. The percentage diagram is presented in Figure 3: species not mentioned there can be found in table 1.

Four ^{14}C dates were obtained from the peaty layers. Their merits are discussed below.

The pollen-bearing deposits start with a dominance of Betula (including *Betula nana*), *Salix* and herbaceous pollen. *Pinus* is almost absent. The upland herbs include *Ephedra, Papaver, Helianthemum, Plantago alpina, Plantago media* and *Potentilla.*

The NAP-values are high. Much of the herb pollen, such as Gramineae and Cyperaceae, which are excluded from the sum, might have originated in the uplands.

The pollen spectra reflect a rather treeless vegetation. The zone fits in the Paris Basin zone 1 as described by Van Zeist and Van der Spoel-Walvius (1980).

The following zone shows a dominance of *Juniperus*, together with *Artemisia* and *Thalictrum*. *Salix* declines, *Betula* values are low and sand is deposited on top of the lake marl formed in the preceding period. The occurrence of sand together with *Juniperus* indicates that many patches of the soil lay bare. *Juniperus* germinates best in bare sand. This zone has no clear match in other Paris Basin diagrams. Paris Basin zone 2 is certainly characterized by high *Juniperus* and *Artemisia* pollen values, but also by high *Betula* values. Perhaps we should look at the *Juniperus-Artemisia* zone in combination with the following one in which again *Betula* dominates. *Juniperus* and *Artemisia* decline, but now *Hippophaë* is present, whilst Gramineae and Cyperaceae show higher percentages than before. The local sediment is a lake marl again. The bare soil of the previous period obviously obtained a cover of vegetation. A light birch forest with both tree birch and dwarf birch covered the landscape again, but with an undergrowth that was different from that of zone 1. The sequence might represent a rather local event. With some caution I should like to label both the juniper zone and the second birch zone as Paris Basin zone 2. The *Juniperus* curve also gave Van Zeist and Van der Spoel-Walvius problems. They remark on zone 2: "from this zone....., one feature of Late-glacial sections from Northern France becomes already apparent, viz. their differences in the pollen record" (Van Zeist and Van der Spoel-Walvius 1980 p. 79).

In the next zone *Pinus* is dominant. The transition from a vegetation dominated by *Betula* to that dominated by *Pinus* is rather abrupt. A hiatus in the sedimentation may be the cause, although no apparent change in lithology could be detected. The *Pinus* rise is still well within the lake marl. The pollen assemblage, with almost no *Juniperus* left, a decline in *Artemisia* and a scarcity of other herbs, fits best into Paris Basin zone 5. A ^{14}C date of 10480 ± 130 BP (GrN-16855), obtained from moss peat, marks the end of the *Juniperus* curve and the definitive decline of the *Artemisia* curve. Van Zeist and Van der Spoel-Walvius give a date of 10520 ± 95 BP for the

beginning of zone 5. If the Maizy-Cuiry dates are incorrect, they will be rather too old than too young because of the presence of lime. The attribution of the zone to zone 5 might therefore be correct. This means that a hiatus is indeed present and that zone 3 and 4 are missing from the record.

The upper border of zone 5 is marked by the appearance of *Corylus*, *Ulmus* and *Quercus*. The *Corylus* curve rises steeply. In the beginning the landscape must have been dominated by this tall shrub, but *Ulmus* soon became important as well. After its rise *Corylus* declines again as *Quercus* percentages rise. *Tilia* arrives halfway the zone. The end of the zone is marked by a decline in *Ulmus*, together with the appearance of *Alnus* and *Fagus*. Herbs are almost absent, so the forests must have been dense. The spectra around -240 cm could not be counted as a result of the presence of too many charcoal particles. A fire must have been burning nearby. This might have been a forest fire; the resultant clearing is attested by the presence of *Plantago lanceolata* and *Fraxinus*. The pollen assemblage zone corresponds with Paris Basin zones 6 and 7. The next zone is characterized by the continuous presence of *Fagus*, which even shows a marked rise. The zone is equally marked by a rise in *Quercus* percentages, a decline of *Tilia* and *Ulmus*, and a continuous *Fraxinus* curve. One *Vitis* pollen grain was counted. The beginning of this zone corresponds with the formation of telmatic peat and a hiatus between this zone and its predecessor cannot be excluded. A ^{14}C date places the bottom of the peat at 3730 ± 60 BP (GrN-16854). The beginning of the continuous *Fagus* curve is the marker for the Paris Basin zone 8/9 transition. This is dated to c. 4000 BP. Zone 8 might therefore be missing in the Maizy-Cuiry record.

Two more ^{14}C dates were obtained from the telmatic peat: 3200 ± 50 BP (GrN-16853) and 2160 ± 50 BP (GrN-16852).

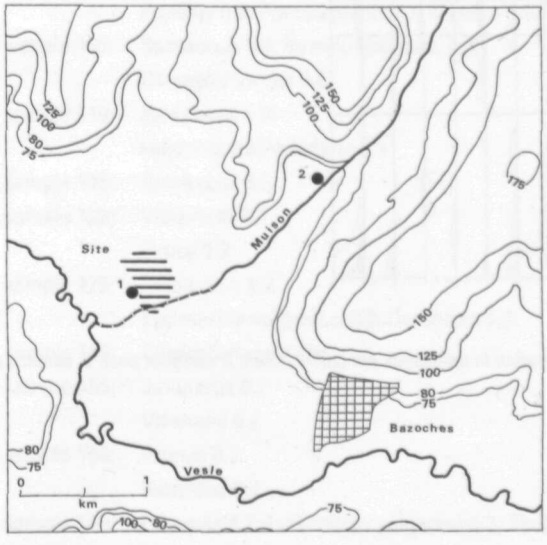


Figure 5
The location of the Bazoches (1) and Vauxcéré (2) cores. Hatched: archaeological site. Double hatched: modern village.

The former belongs to a period in which *Tilia* and *Ulmus* curves start their definitive decline whilst the *Plantago lanceolata* curve becomes continuous. The Paris Basin sequence places zone border 9/10 here, dated c. 3300 BP. As the developments in the Maizy-Cuiry core are very gradual, I did not draw this border line in the present diagram.

The next zone, characterized by the appearance of *Carpinus* and several herbs, amongst which are *Cannabis* and *Secale*, is clearly Paris Basin zone 11. It's beginning is set by Van Zeist and Van der Spoel-Walvius at c. 2150 BP which compares well with the 2160 BP obtained at Maizy-Cuiry.

Summing up the results it may be said that the Maizy-Cuiry core gives information on the former vegetation of parts of the Late Glacial and Holocene. The pollen zonation devised by Van Zeist and Van der Spoel-Walvius can be applied without serious problems and even the ^{14}C dates, which might have suffered from a hard water effect, seem to be reliable. Three zones are missing: numbers 3, 4 and 8. A part of zone 7 may be missing too.

The pollen diagram Bazoches

The core called "Bazoches" was obtained from a peat deposit on the valley floor of the river Vesle (49°16'N, 3°35'E). This deposit is situated not far from the small village of Bazoches-sur-Vesle, in the locality "les Muisemonts" (Figure 5).

The peaty area borders a vast enclosure attributed to the Michelsberg culture. Its two palisades and four ditches encircle a surface area of 10 ha. A later phase of occupation, by the Seine-Oise-Marne culture, around 4500 BP, left a collective burial place.

The peat is situated only 30 m away from the site. Its present surface area is 1 ha, but it must originally have been larger. It was mapped and investigated by Michèle Chartier, who showed me the area and indicated the best places for sampling. I chose her number 11 for boring (Chartier 1991, Figures 33 and 34).

The stratigraphy was as follows:

below surface	
0 - 75 cm	loam, abrupt transition to
75 - 121	alder carr peat
121 - 124	peat with sandy loam
124 - 150	peat, rather abrupt transition to
150 - 195	black compact peat
195 - 200	transition peat-loam
200 - 307	loam to sandy loam
307 - 320	humic sandy loam
320 - 325	sandy loam to sand, end of boring

Molluscs were few and restricted to the loams, although M. Chartier found some molluscs in the peat deposits of other cores.

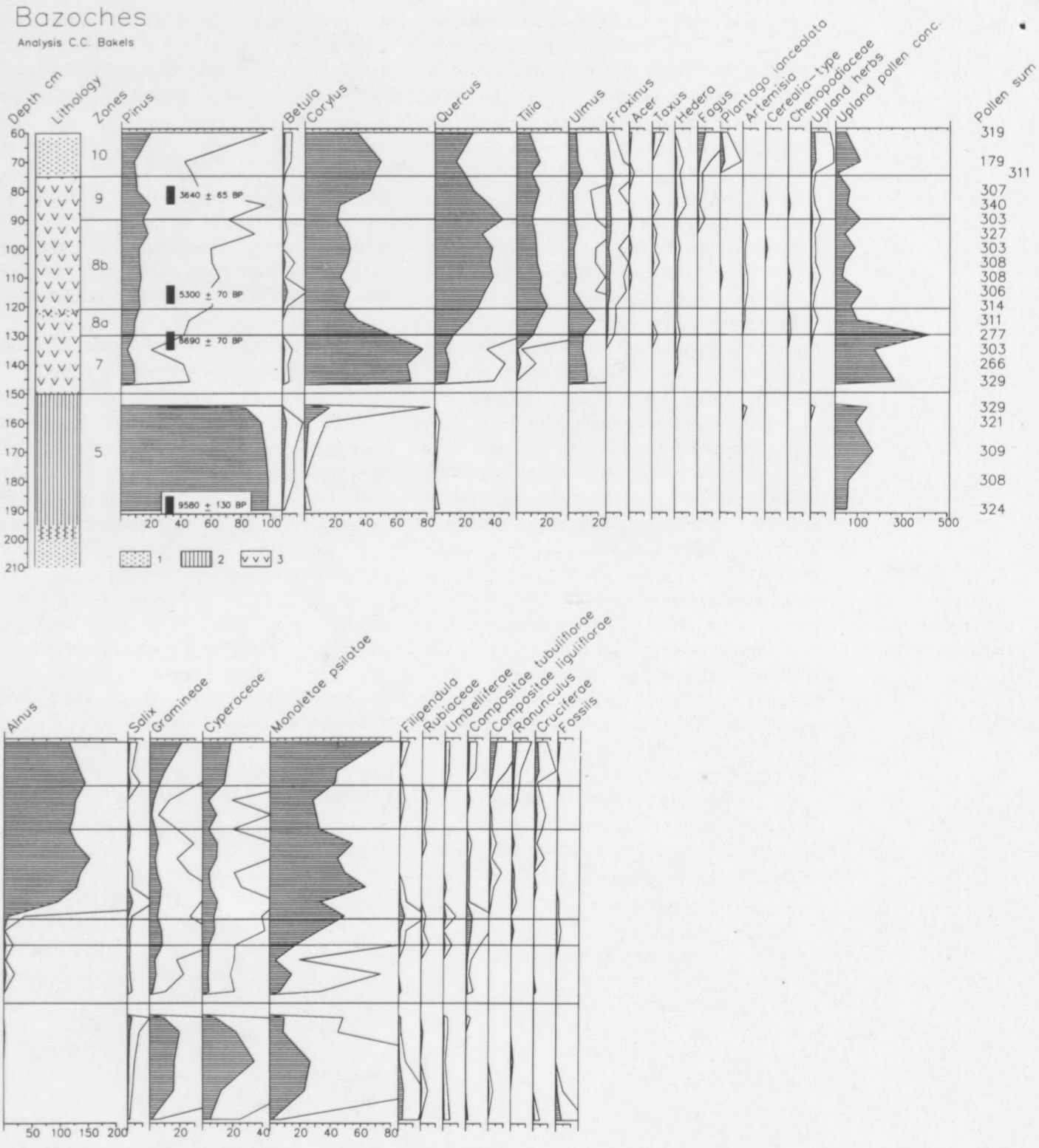


Figure 6

The pollen diagram Bazoches. Open curves 5x. Upland pollen concentration in thousands per cm³. 1: loam, 2: compact peat, 3: telmatic peat and carr peat.

The core was treated in the same way as the Maizy-Cuiry material. The pollen sum chosen is a strict upland sum. *Alnus* was excluded because the tree was clearly a component of the local, peat forming, vegetation. *Salix* and herbs like Gramineae and Cyperaceae were excluded as well. The pollen diagram is given in Figure 6 and the species not drawn are given in table 2. The diagram shows pollen from the peat and upper loam only. The loam under the peat contained little pollen. From the band of humic sandy loam one spectrum, at -315 cm, was counted. Its upland component contained 80% *Pinus*, 7% *Betula*, 3% *Juniperus*, 0.7% *Hippophaë*, 6% *Artemisia*, 0.7% *Ephedra fragilis*, 0.7% *Onobrychis-type*, 0.7% *Plantago media/major* and 0.7% *Sanguisorba minor*. The wetland component (which might not all be wetland here), consisted of 15% *Salix*, 20% *Gramineae*, 78% *Cyperaceae* and 0.7% *Sparganium emersum*-type among others. The spectrum also contained 45% fossil, Pre-Quaternary, pollen and spores. The assemblage is of Paris Basin zone 3 origin, but the layer in question might not be. All *Pinus* pollen were damaged and broken. This, and the high percentage of fossil pollen and spores, suggests that the sediment consists of redeposited material. For that reason this horizon was not further investigated.

The first pollen assemblage within the peat shows a dominance by *Pinus* pollen. Some *Betula*, *Corylus* and *Quercus* pollen do occur but they play a very minor role. The peat contains anther fragments of Gramineae and Cyperaceae, which show that at least this part of the pollen content is of local origin. The upland must have been covered by *Pinus* forests. The assemblage can be attributed to Paris Basin zone 5. The start of zone 5 is set at 10500 BP and it ends at 9500 BP. The ^{14}C date for the start of peat formation at Bazoches, 9580 ± 130 BP (GrN-19477), is thought to be rather young, but still within the range. Contamination with rootlets or other matter from the upper layers of peat growth was not observed.

A conspicuous gap is present between the zone described above and the next. The abrupt changes in the pollen curves coincide with an abrupt change in the lithology. After the hiatus *Corylus* dominates. *Ulmus* is also rather important. The end of the zone is placed at the decline of the *Corylus* curve, the rise of the *Quercus* and *Tilia* curves, and the beginning of the continuous *Fraxinus* curve. It is

Table 2
Bazoches, pollen types not mentioned in the diagram.

sample 60:	Sambucus 0.2; Polygonum aviculare 0.5; Polypodium 0.5; Rumex acetosa-t. 0.2
	Populus 0.2; Humulus 0.2; Frangula 0.2; Caryophyllaceae 0.2; Lythrum 0.2; Iris 0.2; Urtica 0.5; Potamogeton 0.7; Mentha-t. 0.2; Valeriana 0.5; Caltha 0.5; Lysimachia vulgaris-t.0.2; Sphagnum 1.0
sample 70:	Trifolium-t. 0.5
	Humulus 0.5; Potamogeton 0.5; Sphagnum 1.1
sample 74:	Polypodium 0.3; Ericales 0.3
	Caryophyllaceae 0.3; Potamogeton 1.3; Lysimachia vulgaris-t. 0.3
sample 80:	Rumex acetosa-t. 0.3
	Humulus 0.3; Iris 0.3; Potamogeton 0.6; Mentha-t. 0.3
sample 85:	Populus 0.6
sample 95:	Euonymus 0.6
	Urtica 0.6; Valeriana 0.3
sample 100:	Sambucus 0.3
	Populus 0.3; Potamogeton 0.3; Mentha-t. 0.3
sample 105:	Sambucus 1.0; Rumex acetosa-t. 0.3
	Caryophyllaceae 0.6
sample 110:	Sambucus 0.3
	Humulus 0.3; Valeriana 0.3
sample 115:	Sambucus 0.3
sample 120:	Viburnum 0.3
	Urtica 0.3
sample 125:	Trifolium-t. 0.3
	Lysimachia vulgaris-t. 0.3; Geranium 0.3
sample 130:	Caryophyllaceae 0.4
sample 155:	Juniperus 0.3
	Valeriana 0.3
sample 160:	Prunus 0.3
	Valeriana 0.3
sample 170:	Frangula 0.3; Lysimachia vulgaris-t.0.3; Thalictrum 0.3; Sphagnum 1.0
sample 180:	Populus 0.6; Equisetum 1.9

dated to 6690 ± 70 BP (GrN-19476). This zone is Paris Basin zone 7. Van Zeist and Van der Spoel-Walvius give a date of c. 6850 BP for the 7/8 border. Here again, the Bazoches date is rather young.

Peat formation continues until the area is flooded by sediment- bearing water. After this *Alnus* invaded the basin and the peat attained the character of an alder carr peat. The change is accompanied by an *Ulmus* decline, a slight decline of *Tilia* and a distinct increase in the values for *Quercus* and *Fraxinus*. Just before the loam deposition the first upland herbs appear. *Taxus* is present before and after this event. I am inclined to see the changes in the assemblage following the sedimentation of mineral matter as a local event within Paris Basin pollen zone 8. The zone 8/9 transition is defined by the beginning of the continuous *Fagus* curve, dated to c. 4000 BP. In the Bazoches sequence the *Fagus* curve becomes continuous at -90 cm only, and the ^{14}C date for the carr peat just above the peat-with-loam, 5300 ± 70 BP (GrN-19475) is well within zone 8.

The period in which the disturbance detected within zone 8 occurs is contemporaneous with the Neolithic/ Chalcolithic. It is feasible to attribute the changes in the vegetation and the subsequent deposition of eroded loam in this part of the Vesle valley to the activities of man. The appearance of herbs growing in clearances may point towards the cutting down of forest, as does the increasing importance or perhaps only better flowering, of *Fraxinus*. The elm decline might be also have been due to anthropogenous factors. *Ulmus* must have been an important constituent of the former valley floor forests. Oak might have been spared. *Quercus* pollen curves are known to rise after human impact (Bakels 1992). The concentration of upland pollen is lower now than before, which might correspond to the production of less pollen, although this is not necessarily. The invasion of *Alnus*, causing the formation of a new type of peat, might distort the picture.

As is mentioned above, the Bazoches peat is only 30 m away from a vast Michelsberg enclosure. Its construction is thought to have taken place slightly after 5200 BP. This is perhaps too late to attribute the first clearance and deposition of some mineral matter to the Michelsberg people. Nevertheless, it is tempting to do so. In any case it is strange that such a large structure did not leave more traces in the pollen records. To attribute the missing impact to a hiatus in the fill of the basin might be one solution, but perhaps not a very satisfactory one. Another reason may be that the activities carried out within the enclosure interfered very little with the immediate surroundings. It is known that the place did not function as a normal settlement.

The next zone shows a low but continuous *Fagus* curve. As mentioned above this is Paris Basin zone 9. It is the last zone present in the peat. The loam on top must belong to zone 10. The change in sediment is abrupt. *Carpinus* is still absent, but *Plantago lanceolata* is present with a continuous curve which is in accordance with the definition of zone 10 by Van Zeist and Van der Spoel-Walvius.

Summing up the results obtained from the Bazoches core I conclude that at least one zone, zone 6, is absent. The Bazoches ^{14}C dates are a little young.

Former vegetation of the Aisne and Vesle valley sides and floors

The peats in question are very restricted in the surface area they cover. One peat deposit has formed at the bottom of a short, steep-sided valley just where it joins the Aisne valley. The pollen caught in its organic deposits must have had its origin within a small area, i.e. the slopes of the valley itself, its floor and the adjacent terrace of the Aisne. The other peat deposit lies on the floor of a much wider valley which is comparable to that of the Aisne. Most of its pollen would have had its source in the vegetation of the Vesle valley floor and its sides. Some pollen may have come from sources upstream, washed in during floods, but as mineral matter is restricted to one horizon in the peat this source may not have been too disturbing. Moreover, during most of its course the Vesle flows through comparable landscapes with the same kind of occupational history. The pollen records preserved in the deposits may therefore serve for a reconstruction of former vegetations on the valley sides and floors, which were the main locations for pre- and protohistoric settlement.

One other pollen diagram is known from the area: the Vauxcéré diagram by Vasseur (1990). Its source is comparable to Maizy-Cuiry. The organic deposits were formed in the valley of the Muison, a tiny tributary of the Vesle near Bazoches (Figure 5).

Information on the Late Glacial is only provided by the Maizy-Cuiry diagram. Zone 1 shows a landscape with an open vegetation. The only "trees" present were birches, partly dwarf birches, and shrub-like willows. The herb vegetation was rich in species and had the character of a steppe tundra with an emphasis on the steppe element, as is indicated by the distinct presence of *Helianthemum* and *Ephedra* for instance. The Chivres diagram (Van Zeist and Van der Spoel-Walvius 1980) from a boring carried out in the Marais St. Boëtien, 30 km to the north, led its authors to a similar reconstruction. The picture might therefore apply to a wider region than the Aisne valley alone. Zone 1 is thought to represent the earliest Late Glacial.

In the period covered by zone 2a the rich vegetation had partly vanished. Local sands lay bare, but this phenomenon might have been restricted to the sands exposed in the sides of the small valley. Juniper and *Artemisia* did well under these conditions. Later on light birch forest with both tree and dwarf birch covered the area. The shrub *Hippophaë*, rare according to Van Zeist and Van der Spoel-Walvius (1980), was also present at this locality.

Pinus was still absent. The forest had an open character. It represents the Late-glacial vegetation before the Allerød. The remainder of the Late Glacial left no traces in the deposits discussed here.

Zone 5, which is said to coincide with the lower half of the Pre-boreal, is represented in the Maizy-Cuiry, the Bazoches and the Vauxcéré cores. The latter shows that open pine-birch forests with an undergrowth of mostly grasses were present in the beginning. This stage is not yet present in the other two. During most of the Pre-boreal, however, the area was covered with pine forests. Grasses seem to have been the main herbs growing there, at least in Bazoches and Vauxcéré. Maizy-Cuiry also had *Artemisia*. According to the pollen records the undergrowth was rather monotonous. This is an unexpected result since Van Zeist and Van der Spoel-Walvius talk about luxuriant ground flora.

The upper part of the Pre-boreal is not very well expressed in the pollen diagrams. Hazel spreads very fast. At the same time elm and oak establish themselves and elm-oak forests might have formed part of the vegetation very rapidly, expanding at the expense of hazel.

Zone 7, which covers the whole of the Boreal and the first half of the Atlantic, is characterized by dense deciduous forests of hazel, elm and oak. In its last phase lime is present too. This zone is clearly missing in the Vauxcéré core, as was already supposed by its author. The horizon with a lot of charcoal in the Maizy-Cuiry core belongs to the upper part of zone 7, and is therefore dated earlier than 6850 BP. If the fire was ignited by man, which is by no means proved, it was caused by Mesolithic hunters and gatherers. *Plantago lanceolata* was counted just afterwards. This herb was also present in other early Paris Basin deposits, Valleé de la Voise, with a ^{14}C date of 6880 BP, for instance (Van Zeist and Van der Spoel-Walvius 1980 p. 94-95). The occurrence of a few pollen grains from this plant is therefore not necessarily an indicator of Neolithic people. Van Zeist and Van der Spoel-Walvius did not want to choose between a true occurrence and contamination or long distance transport. I would like to support the first option.

The Boreal and Early Atlantic show similar vegetations in the Maizy-Cuiry and Bazoches diagrams. Other diagrams from the Paris Basin show that elsewhere the picture can be quite different.

Pollen zone 8 constitutes the period of the fully-developed deciduous forest, but without beech (and hornbeam). Zone 9, on the contrary, is defined by the presence of a low, but continuous *Fagus* curve. Zones 8 and 9 comprise the upper part of the Atlantic and the greater part of the Sub-boreal. These will be considered together. During most of the period local forests were dense. Elm, oak, lime and hazel were the most important trees on the higher soils. Ash was present as well. Yew (*Taxus*) and maple (*Acer*), which are notoriously underrepresented in pollen records, must likewise have been rather common. At the end of the period beech was present in low numbers. The composition of the forest cannot have been the same everywhere. Differences in relief, soil and groundwater-table must have caused diversity. Because of the hiatuses in the pollen records, however, the differences between a forest in a side valley and one on a wide valley floor, for instance, cannot be reconstructed here. Elm, however, was absent in the vegetation at Vauxcéré, whilst lime was the most important tree there. As the Vauxcéré core is perhaps the best recorder of vegetation on the higher valley sides and the plateau, this might imply that lime was the dominant tree of the true upland, whilst elm, well represented in the Bazoches diagram, was more a tree of valley bottoms. This view is supported by the much lower values for *Ulmus* when *Alnus* expands.

In the region under review alder is presumably replacing elm during zone 8. This remains so even when the elm values in the Maizy-Cuiry diagram are recalculated without alder in the pollen sum. The change from elm to alder on the wetter parts of valley floors is by no means contemporaneous everywhere in the Paris Basin. Ranges are from 6700-3900 BP. If there is no hiatus present in the Bazoches record, it took place in the Vesle valley around 5300 BP. Vauxcéré gives a date somewhere between 5500 and 4000 BP. J. Vasseur thought the Vauxcéré dates too young, but her opinion is based on the idea that the elm decline should define the border between the Atlantic and Sub-boreal. Due to a hiatus in the Maizy-Cuiry sequence, the invasion of alder in the Aisne valley cannot as yet be dated.

Why the expansion of alder is not synchronous, is by no means clear. Human activity, such as cutting down forests, may be one of the agents. In the diagrams presented here, the fact that the curve of ash, a light-demanding tree, rises with the alder curve, supports this view, but this is not seen everywhere in the Paris Basin.

Elm, ash and alder are not the only trees which show that the landscape was subject to changes during zones 8 and 9. In the course of time oak became more important. The question as to how the changes must be explained is still difficult to answer, but the activities of man certainly played a role. During this period both valleys were relatively densily settled and it is surprising that no more changes are seen. Herbs pointing towards the existence of clearings are, in particular, almost absent. Hiatuses at Maizy-Cuiry and Vauxcéré might be partly responsible for the fact that I cannot reconstruct the Neolithic impact on the primeval forests more clearly, but the absence of large-scale disturbance at Bazoches is unexpected. As mentioned above, this might have connection with a special use of the enclosure, perhaps one that was not year round and did not disturb the environment, that is if a hiatus is not the cause.

Only halfway zone 9 changes do set in at Bazoches which are thought to be truly anthropogenous. The oak pollen

percentages decrease, whilst hazel values increase. The phenomenon is dated around 3600 BP and might be connected with the activities of an Early Bronze Age population.

In Maizy-Cuiry oak still increases and hazel does not react much, but lime decreases. Some herbs appear, including *Plantago lanceolata*. This might imply that the local forests on the valley slopes became less dense, with a few open spaces, but not so much that hazel could flower better or expand more than before. Another explanation would be that people started to disturb the upland forests on a wider scale than previously, but at a distance, leaving the side valley rather intact. In the first case local cattle grazing could be the factor in question, in the second case the laying out of cereal fields may also be a reason. These changes took place during the Bronze Age.

Zones 10 and 11 show the influence of man still better. The Late La Tène, Gallo-Roman and later, deforestation, zone 11, has become pronounced, both in the uplands and on the valley floors. Cultivation of hemp (*Cannabis*) and rye (*Secale*) must be attributed to farming practices from the Gallo-Roman period onwards. Carbonized rye was found in a Gallo-Roman context in the neighbourhood (Bakels 1984). Walnut (*Juglans*) should follow the same pattern, but one pollen grain found in zone 10 disturbs the picture. It might be a stray find from long distance transport or even contamination. The grape (*Vitis*) pollen grain also found in zone 10, might belong to either a wild or a cultivated grape, but as no traces of grape consumption or wine cultivation, i.e. grape pips, were found in the numerous excavations, it might be safe to consider it to be wild.

Final remarks

The cores Maizy-Cuiry and Bazoches did provide a reconstruction of Late Glacial and Holocene vegetation in the valleys of the Aisne and Vesle. The picture is not continuous, however. The presence of hiatuses hampered the work, but this was to be expected, hiatuses being the rule in these kind of deposits.

The zonation established by Van Zeist and Van der Spoel-Walvius proved to be very useful. This zonation does not correspond with the classic ones, but some attempt to correlate the Paris Basin zones with the others was already made by its designers.

All diagrams published up till now point towards the existence of marked local differences in the natural vegetation and the timing of changes. The picture drawn here for the Aisne and Vesle valleys need not be universal. It is not the place here to discuss the situation in the whole of the Paris Basin, but I hope to have contributed new evidence for the vegetational history of this interesting part of Northern France.

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